CLINICAL LECTURES

ON

DISEASES OF THE EYE.

BY

CHARLES BELL TAYLOR,

M.D., F.R.C.S.E.

Hon. Surgeon Nottingham and Midland Eye Infirmary.

LECTURE III.

SQUINT.

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LECTURE III.

SQUINT.

Allow me to call your attention to a patient suffering from the most common form of squint,—

"*Strabismus convergens concomitans.*"

This little girl, Janet S., from Pye Bridge, is six years of age, and was first observed to squint about two years ago. Her mother assures us that the child caught the affection from a playmate, and I have no doubt that she has convinced herself that such is the case. We are all so apt to attribute to accident, or some outside cause, those innate diseases or malformations which are part and parcel of ourselves, that we need not wonder that the parents of squinting children should ascribe the defect to imitation, a habit of staring at a prominent lock of hair, a feather in the head-dress; or to worms, teething-convulsions, or some other extraneous cause, which has, in reality, nothing whatever to do with the case.

This child first began to squint two years ago, because she then began to learn to read and sew; such patients squint so soon as the eyes are used for near objects, and the more they are thus used the worse does the defect become. Squinting is more common in towns and great centres of industry than in agricultural districts, simply because the children are earlier and more highly educated.

You will notice in this case that the child shows a slight tendency to turn the left eye inwards at times, but the right is much the

worst, and we have ascertained that the sight of this eye is the weaker of the two, although she can still decipher large print with it.

It is well that we should have some means of expressing the extent of the deviation in cases of squint, and this is usually done by measuring from the median plane of the orbit. If I make a dot on the lower lid exactly in the centre, which is the normal position of the pupil when the eye is at rest, and another in continuation with a vertical line drawn through the centre of the right cornea in its abnormal position, we find the distance between the two dots is exactly 3½ lines, and this is the extent of the squint.

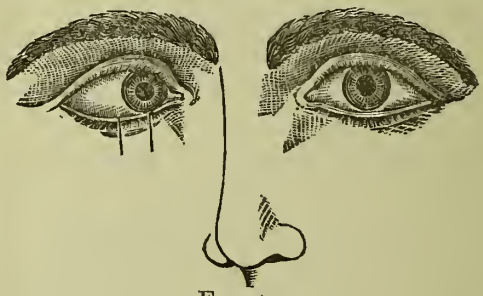

Fig. 1.

If I now close the left eye and direct the patient to look straight with the squinting one, it assumes its normal position, but, on raising my hand, we find that the left eye has become the squinting one, and, moreover, that the extent of the deviation is exactly the same as that of the right eye.

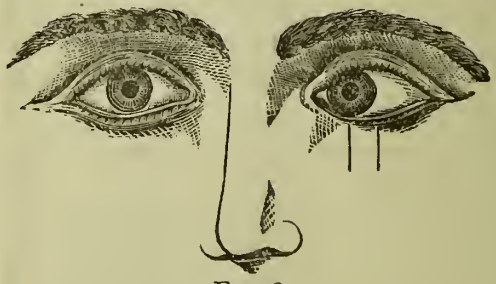

Fig. 2.

You will see this perfectly if, instead of closing the left eye, I hold a piece of ground glass before it. This shuts out the left eye from any participation in the act of vision, although you are able to see

through the glass the exact position assumed by it when the right, or squinting, eye is looking straight. It is as though the two eyes were connected by a cord that was too short to permit them both to look straight at once, and that whatever was taken on one side had to be given from the other. This is what is meant by concomitant,—that is, the straightening of the squinting eye is *accompanied* by the squinting of the other, and the fact that the patient squints first with one eye and then with the other, also brings the case under the definition of "Alternating." The deviation of the right, or squinting, eye is called the primary deviation; the deviation of the left or sound eye, when covered or seen through the ground glass, the secondary deviation. The primary and secondary deviations always correspond exactly in cases of concomitant squint, and it is essential to note this, because when the squint is due to paralysis the secondary deviation greatly exceeds the primary. Convergent strabismus from paralysis is not by any means a common affection, but through the kindness of a private patient I am enabled to show you a case. This gentleman, Mr. P., from Derby, is thirty-six years of age, and, as you perceive, squints very decidedly inwards with the left eye. Now, if I direct him to follow my finger with the squinting eye, you see that he cannot force it outwards beyond the centre of the orbit, while the great effort he makes in this direction causes him to squint much more with the right eye than he did before with the left. To appreciate the value of this symptom, you must remember that you cannot turn the left eye outwards without at the same time turning the right eye inwards,—they are associated actions. The central nerve ganglia of the left external rectus and the right internal rectus are intimately connected, and when this patient makes an effort to turn his paralysed eye outwards, although he cannot effect his object, he is at the same time doing his utmost to turn the right eye inwards; hence the effect, although *nil* or nearly so on the paralysed external rectus of the left eye, is greatly in excess on the healthy internal rectus of the right. This distinguishes cases of paralysis from cases of concomitant squint, and you will notice a similar association of symptoms in patients suffering from uncomplicated paralysis of the superior rectus, where, owing to the connection of the central nerve ganglia of the superior rectus and levator palpebræ, the effort to look upwards raises the lid of the paralysed eye out of all proportion to its fellow.

Why should so many children begin to squint when they first begin to read, or write, or sew? Simply because they cannot see unless they do. Their eyes are too short in the long axis, that is from before, backwards. The refraction is too low, and objects, instead of being focussed upon the retina, are depicted upon a spot a little beyond it; hence the patient makes extraordinary efforts to lengthen his eye, or increase its refraction, so as to bring the picture into its proper place. You will understand this at once, if you compare the accompanying outline of the short eyeball (Fig. 3) with its fellow of the normal eye (Fig. 4).

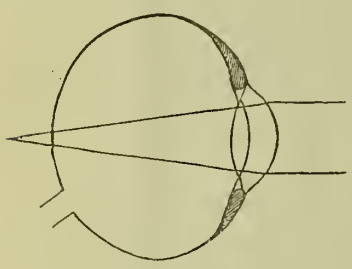

Fig. 3.

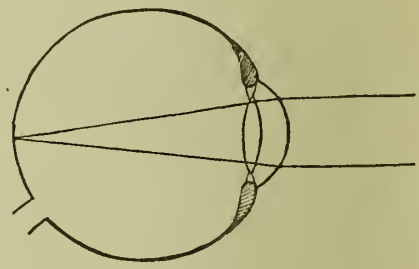

Fig. 4.

You may say, "What has this to do with squint? Squinting will not alter the shape of the eye-ball." No; but it has a similar effect, as I will now explain. Patients whose eye-balls are too short are said to suffer from hypermetropia; they are obliged to exert a certain amount of accommodation; that is, render the lens optically stronger by increasing the curvature of its anterior surface by the active exercise of the ciliary muscle, even when looking at distant objects,—an effort that is not at all required of the normal eye. Rays of light proceeding from objects twenty feet distant are parallel, or nearly so, and, in an eye-ball of ordinary dimensions, are brought to a focus on the retina by the power of refraction of the cornea and lens alone when the eye is at perfect rest, and without any exertion of the ciliary muscle.—*(See preceding diagram No. 4.)* In hypermetropic persons it is necessary that the convexity of the lens should be increased before these parallel rays can be brought to a point, as indicated by the dotted lines in diagram No. 5, where the hypermetropic eye-ball is seen successfully bringing parallel rays of

light to a focus on the retina by increasing the curvature of the anterior surface of the lens, an effort which, in an eye of ordinary

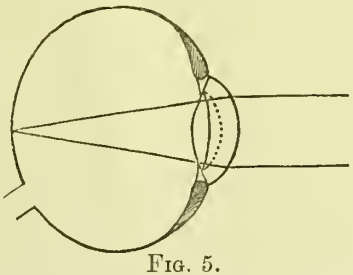

Fig. 5.

dimensions, is only required for the divergent rays which emanate from near objects. Now if the hypermetrope is obliged to accommodate for distant objects, the rays from which are parallel, you can readily understand that considerable exertion is required in order to enable him to focus near objects, the rays from which are divergent; and this excessive effort of accommodation involves a squint, because the power of accommodation is greatly increased by convergence of the optic axes. The central nerve ganglia of accommodation and convergence are intimately connected; they are associated actions—go hand in hand; and the one is necessarily accompanied by the other. If I put on a pair of concave spectacles, rays from distant objects are rendered to me divergent; I am compelled to accommodate for them, and I convert my normal eye into a hypermetropic one. If I now try to read, a still greater effort of accommodation is required, and I am at first unable to do so, but with an extra effort I manage to decipher newspaper type. Now, if you watch, you will find that this effort of increased accommodation has caused me to squint; that is, in order to exert sufficient accommodation to overcome this concave glass when looking at near objects, I am obliged to squint, and this is the case with hypermetropic children. If I use a strong pair of concave glasses, no effort at accommodation will enable me to overcome them: the squint in that case would be of no use, and is therefore not called into requisition. Hence, persons whose eye-balls are very short, who suffer from high degrees of hypermetropia, are not nearly so likely to squint as those suffering from moderate degrees of the same affection. You will often find whole families of children who, paradoxical as it may appear, inherit squint from parents whose eyes are perfectly straight. The father suffering from a high degree

of hypermetropia, while the mother's eyes are normal, or *vice versa*, the result being moderate degrees of hypermetropia in the children, who squint to overcome it, and are often supposed to catch the affection from one another.

If I neutralise the concave glass with an equally strong convex one, no effort is required, and I can read as well as ever. Why, therefore, do we not cure squint by neutralising the hypermetropia with a suitable convex glass? A most rational suggestion; and no doubt great good may be effected in this way, as well as by paralysing the accommodation with atropine; but, in point of fact, these patients do not come to us, as a rule, until they have squinted for some time: often they only do so because their lives have been rendered miserable by the scoffs and jeers of their schoolfellows and playmates. Prolonged treatment with spectacles constantly worn, and which only mitigate the defect, still subjects them to remark,—indeed tends to aggravate rather than diminish this serious evil,—and consequently offers no attraction either to our patients or their friends. Moreover, it is dangerous for little children to wear spectacles out of doors, or when at play, they are so apt to be injured by fracture of the glass; and, strange as it may appear, after they have squinted for some time they won't leave off, even though you give them glasses so strong that the squint, far from assisting, actually disturbs vision. The old axiom, "*Sublatâ causâ tollitur effectus*," does not apply here, for we are compelled first of all to remove the effect by operation, and afterwards to deal with the cause as best we may. We have, therefore, no choice but to operate in this case.

Before doing so, however, allow me to show you another patient. This boy, James L——, from Louth, is eleven years of age, and has squinted for the last seven. Though the deformity is still manifest, the boy's mother assures us that it is not nearly so bad as it was, and when I suggested that his sight must be weak, eagerly denied that vision was in any way affected. Patients and their friends very often overlook weak sight when it affects one eye only, and although I have not yet tested this boy's vision, my experience enables me to tell you that it is seriously impaired. I am sure of this, because the squint has become altogether one-sided, "monolateral," as it is termed; has existed for years; and, above all, because, as his mother tells us, it is not nearly so bad as it was. In this case I have no

doubt that the squint was at first like that of the little girl we have just examined—"Alternating;" *i. e.*, he sometimes used the right eye, sometimes the left; and although they were never both in use together, so as to produce binocular or stereoscopic vision, the sight of each was preserved by alternate practice, and the effort to see with the squinting eye rendered the deformity much more manifest than it is at present. Now, as you perceive, the squint affects one eye only—which is barely influenced by the effort at convergence which accompanies the endeavour to see near objects, but wanders to and fro in a purposeless sort of way, and is thus in occasional accord with its fellow. Hence, the friends congratulate themselves that he has nearly grown out of his squint, and are dubious as to the necessity for any operation.

Now you see if I close the right eye, the boy is unable to decipher Jæger's largest test type—

In fact, the sight is worse even than I anticipated, and this is what happens when a patient grows out of a squint: growing out of a squint really means growing blind on one eye. Here is the same patient's brother, aged six years, who, as you perceive, is similarly afflicted, only in this case it is the right eye which is affected. Now if I close the left, and request him to look straight with the squinting eye, he does so; but then the other squints to the same extent,—like the little girl on whom we are about to operate. This is the first stage of squint. This boy, if neglected, would soon be as bad as his brother; at present he cannot see with both eyes at once, because that would involve double vision; but he sees well enough first with one eye and then with the other, and this alternate use of the eyes preserves the sight. If such cases are not treated, as time goes on—it may be in weeks, months, or years—one eye becomes permanently the squinting one, it is definitely excluded from the act of vision, and from that moment sight begins to fail: first eccentric portions of the retina lose their sensibility, then the yellow spot deteriorates, and

lastly the inner portion fails likewise. If you push one of your eyes ever so little on one side you immediately see double,—there is a true image and a false image, and the deterioration of sight which takes place in squint-eyed persons is simply due to the constant negation of the pseudo image of the squinting eye by the brain. We only see what we look at; we only hear what we listen to. The brain has a horror of double images, and the persistent exercise of this mental act of suppression causes, in time, loss of function,—"Amblyopia from exclusion," or "ex anopsia," as it is termed,—and is followed in due course by more or less atrophy of nerve tissue and fibrous degeneration of the muscles involved.

These facts are well illustrated by the elder of these two boys. Note if this lad tries to fix an object with the squinting eye, it oscillates; he is trying to find a healthy spot of retina on which to focus the object. If we press him to tell us what it is, he makes a final effort, but instead of looking straighter, as you would expect him to do, and as he would if the retina were fairly sensitive, he squints worse than ever. Why is this? He is simply trying to bring the last remnant of healthy tissue to bear upon the object we have requested him to designate. When a squint alternates, sight may be restored and the squint cured perfectly; when it has become monolateral, the squint may be cured and the sight vastly improved, if we see the patient within a reasonable time; but in advanced cases, such as this, restoration to sight is almost hopeless, and all we can do is to rid the lad of his deformity, and then do our best to improve vision by galvanism and the use of strong magnifying glasses.

We shall now proceed to operate upon these patients, and in doing so we have choice of four methods:—Von Græfe's, the Moorfields method, Mr. Liebriech's, and a modification of these which you have seen me adopt very frequently in the cases treated at this Institution. Von Græfe makes an incision into the conjunctiva, and sub-conjunctival tissues, exactly over the insertion of the internal rectus tendon, inserts

Fig. 6.

a small hook along the upper border of the tendon—not the lower as usually stated in our handbooks,—and divides it with scissors close to

the sclerotic. Whenever I saw Von Græfe operate, Dr. Waldau who was like a third hand to him, always kept the eye everted with forceps during the whole process.

Fig. 7.

The Moorfields Surgeons make an incision below the lower border of the tendon, between the insertion of the inferior and internal recti muscles, pass a much larger hook under its lower edge, and

Fig. 8.

divide it sub-conjunctivally; while Mr. Liebriech, before dividing the tendon, is very careful to dissect the conjunctiva caruncle and plica semilunaris from the subjacent parts. Each of these methods have their advantages, and the operation I usually adopt appears to combine them in a satisfactory degree. I pinch up the tissues immediately over the insertion of the internal rectus tendon, as in Von Græfe's method, separate the conjunctiva pretty freely so as to avoid shrinking of the caruncle, insert the small hook under the lower border of the tendon, cause its extremity to project beyond the upper border, and cut on it with scissors, so as to make a counter puncture, which permits the escape of blood and enables the operator to ensure complete division of the upper border of the tendon, that which is so apt to slip off the hook, and through this counter puncture divide the rest of its attachment under the small bridge of conjunctiva which is allowed to remain.

In the case of the elder M. it will be impossible to restore complete harmony between the two eyes, owing to the want of sensational guidance, the result of the extreme amblyopia, which has existed for so long. We shall, however, be able to remove his deformity by operating pretty freely upon the squinting eye, and, in doing so, it will be well to preserve the normal aspect of the globe as far as possible, by adopting Mr. Liebriech's plan of undercutting the caruncle and plica semilunaris, so as to prevent retraction and avoid that glass-eyed appearance which so often mars the result in these cases.

In Janet L.'s case, and that of the younger M., it will be necessary to operate upon both eyes. We noted in these cases that the eye which was closed, whether right or left, becomes for the nonce the squinting one. Now, if both eyes are closed, as in sleep or during anæsthesia, both squint, and the primary deviation, limited during waking moments to one eye, becomes equally divided between the two, thus—

Fig. 9.

Here is clear evidence of the binocular nature of squint, and you can readily understand that it would be futile to operate upon one eye only for an affection which so evidently affects both. The tendon of the squinting eye should be divided rather more freely than the other, and in apportioning the dose between the two eyes it is well to test the sight immediately before operation, reserving the major procedure for the weaker eye of the two.

Most authors recommend us to do one eye only at a time, and this would be no doubt safe practice if we could do as we pleased with our patients; but, in point of fact, we cannot do as we please, and in deciding upon the best course to adopt, we must take into account

various outside factors which are likely otherwise to disturb the result of our calculations. Two or three operations involve the repeated administration of anæsthetics, which patients dread more and more each time they are used. If I operate upon one eye only in either of these cases, the other eye is certain to squint, just as it does if closed or covered with ground glass, and indeed the operated eye itself would appear only slightly better. When this is the case the parents are disappointed, while friends and acquaintances who deprecated the operation are triumphant, and often succeed in persuading them to decline any further interference. In my own practice I generally divide both tendons, and am not satisfied until parallelism is pretty nearly restored.

Here is a patient operated on a fortnight ago, who has been good enough to sit for her photograph, in order that you might compare her then and present condition. The original squint in this case was in the right eye, as shown in Fig. 10 ;

Fig. 10.

transferred, when the squinting eye was covered with ground glass, to the left eye, as shown in Fig. 11.

Fig. 11.

In this case I operated upon both eyes at once, securing at one seance the result shown in Fig. 12.

Fig. 12.

If I had operated on the squinting eye only in the present instance, the patient would have squinted with the other, and presented an appearance similar to that shown in Fig. 11, and she would have returned home—a considerable distance—very little better for what had been done. Of course such a condition would admit of remedy; but, as I remarked before, you cannot do as you please with your patients, and if you send them away only half done, as it were, it often happens that they do not return.

If I have reason to suspect that too much has been done, I limit the effect by catching up the tendon and adjacent tissues with a suture, and stitching it to the conjunctiva and sub-conjunctival tissues at the inner edge of the cornea, taking up a greater or less portion of tissue according to the effect it is desirable to produce. When the patient has completely recovered from the effects of the anæsthetic, this may be tested, and the suture loosened, tightened, or removed, at pleasure. When the squint is very slight—not more than two lines—you may succeed by operating on one eye only; but the graver varieties, unless when one eye has become completely amblyopic, require the division of both tendons. When the tendon of the internal rectus muscle is divided it falls back and becomes attached to the globe lower down, hence it acts with diminished purchase and annuls the angle of the squint.

The first effect of the operation is somewhat diminished when the tendon becomes re-attached to the globe, and is afterwards, in the course of a few weeks or months, slightly increased, owing to the action of the opponent muscle, which is now enabled to exert a greater influence upon the eye, so that a slight residual convergence will often disappear. This desirable end is much more certainly attained by the use of spectacles, which correct the hypermetropia. If, on the other hand, we find that the ultimate result is a tendency to eversion, this malposition may be corrected by withholding glasses, so that the necessity for convergence, accompanying increased accommodation, may help to restore the parallelism of the globes. If, in spite of this, we find that one or both eyes are turned slightly outwards, they may be readily put straight by dividing both external recti muscles sub-conjunctivally.

Practice, and attention to the rules I have laid down, will enable you to command most brilliant results in cases of squint. We have

operated upon thousands of patients at this institution: it is a rule that each shall return within a few months, so that we may note the ultimate result. One easily forgets faces in a large practice, and it frequently happens, as you know, that we fail to recognise them, so completely has the ocular defect been removed.

Here is a young man—Charles Fitch, from Staveley—on whom you saw me operate three weeks ago. He had for eighteen years suffered from a very marked deformity caused by internal strabismus, and was restored to his present condition without anæsthetics, by an operation that did not take five minutes.

It was not so in former times: Dieffenbach and his followers used to divide the belly of the muscle some distance from its insertion into the sclerotic, outside the capsule of Tenon, which was frequently lacerated in the process, and the result was that the muscle did not become re-attached to the globe, but fell back, so that the unopposed rectus externus rolled the eye outwards, producing a worse deformity than before.

Here is a patient,—at present coachman to Mr. Unthank, surgeon, of this town,—on whom you saw me operate five weeks ago, for a frightful deformity of this kind, occasioned by an operation for internal squint—performed at St. Bartholomew's hospital twenty-six years ago. His eyes are now, as you see, perfectly straight; but the effects of the original operation are still manifest by a retracted caruncle in both eyes.

[The three patients, Janet S. and the two L.'s, were then placed under the influence of a mixture of chloroform and ether, and operated upon in succession in the manner described.]

Remarks after Operation.—The results of the operation you have just seen upon the younger L. and Janet S., so far as I can judge, leave nothing to be desired; there is, however, a slight residual convergence in the case of the elder L., which may or may not require correction by slight tenotomy of the internal rectus of the sound eye. We shall not, however, attempt this until we see what is the result in a few week's time.

I am asked whether all cases of internal squint depend upon hypermetropia; and what is the cause of divergent strabismus? Well, I should say that 90 per cent. of the cases of internal strabismus are caused by hypermetropia. It is true that there are odd cases for

which it is difficult to account, and which may be occasioned by imitation; by the infant being always carried on one arm, so that the eyes, constantly turned on the nurse's face, squint in that direction; or by worms, teething, or convulsions;—causes to which the public are in the habit of attributing all cases of squint. This, however, is not a matter of very much importance, since the treatment by operation is the same. There is one important cause of internal squint, however, which I must not fail to mention, and that is corneal opacities: in these cases a shadow is thrown upon the retina by the interposition of an opaque film, and the patient turns his eye so as to reduce the annoyance thereby occasioned, by throwing it upon the least sensitive part of the retina. In these cases it is often necessary to shift the pupil, as well as to divide the tendon of the internal rectus; and in bad cases the patient's aspect is much improved by tatooing the cornea.

With regard to divergent strabismus, you can readily understand that while the short, round, globular eyeball of the hypermetrope is readily rolled in all directions, the ellipsoidal, egg-shaped organ of the myope is with difficulty moved in any direction; specially is this difficulty felt when the patient attempts to look inwards: in fact, the strain is more than the internal recti can bear; hence, after a time, these muscles give way, and the eyeball, *sua sponte* as it were, rolls outwards. In these cases we must weaken the external recti by setting them further back, and, if necessary, strengthen the internal, *i. e.*, give them a greater purchase, by stitching them inwards.

As to the case of paralytic squint which you saw, I have no doubt the deformity is occasioned by some central lesion, such as pressure upon a nerve trunk by thickened periosteum at its point of exit from the cranium, or by the growth of a tumour, probably gummatous, interfering with the central ganglia of the nerve involved. I feel confident that he will recover under a prolonged course of iodide of potassium and blue pill;* but should I be disappointed, it would be right to divide the internal rectus, and stimulate the external by the continuous, and interrupted, electric currents, from which I have seen excellent results in certain cases of squint. I shall, however, go fully into this part of the subject on another occasion, when I hope to show you some interesting examples of paralysis of the ocular muscles.

* The patient alluded to recovered perfectly under the treatment adopted.

The accompanying photographs of patients operated on since this lecture was delivered are fair samples of the results attained in cases of internal and external squint.

INTERNAL SQUINT BEFORE OPERATION.

THE SAME AFTER OPERATION.

External Squint.

In these cases it is necessary to divide the external rectus muscle very freely. Dissect down to the internal rectus and bring it forward, securing a correct position by means of sutures.

BEFORE OPERATION.

THE SAME AFTER OPERATION.

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